

**I CLAIM:**

1 1. A method for mounting a protuberant conductive contact to an  
2 electronic component, the method comprising sequential steps  
3 of:

4 providing a wire having a continuous feed end,  
5 intimately bonding the feed end to the component,  
6 forming from the bonded feed end a stem which protrudes  
7 from the component and has a first stem end thereat,  
8 severing the stem at a second stem end to define a  
9 skeleton,  
10 depositing a conductive material to envelope the skeleton  
11 and adjacent surface of the component.

1 2. The method as claimed in Claim 1, and immediately before the  
2 severing step intimately bonding the second stem end to the  
3 component.

1 3. A method for mounting a protuberant conductive contact to an  
2 electronic component, the method comprising sequential steps  
3 of:

4 providing a wire having a continuous feed end,  
5 intimately bonding the feed end to the component,  
6 forming from the bonded feed end a stem which protrudes  
7 from the component and has a first stem end thereat,

8 severing the stem at a second stem end to define a  
9 skeleton,

10 depositing a conductive material to jacket the skeleton  
11 and adjacent surface of the component.

1 4. The method as claimed in Claim 1, and immediately after the  
2 severing step, continuing sequentially the bonding step and  
3 the forming step and the severing step for a predetermined  
4 number of stems to comprise the skeleton.

5 5. The method as claimed in Claim 4, and immediately before each  
6 of the severing steps each of the second stem ends is inti-  
7 mately bonded to the component.

1 6. A method for mounting a protuberant conductive contact to a  
2 conductive terminal on an electronic component, the method  
3 comprising sequential steps of:

4 providing a wire having a continuous feed end,

5 intimately bonding the feed end to the terminal,

6 forming from the feed end a stem which protrudes from the  
7 terminal and has a first stem end thereat,

8 severing the stem at a second stem end to define a  
9 skeleton,

10 depositing a conductive material to envelop the skeleton  
11 and adjacent surface of the terminal.

1 7. The method as claimed in Claim 6, and immediately before the  
2 severing step intimately bonding the second stem end to the  
3 terminal.

1 8. The method as claimed in Claim 6, and immediately after the  
2 severing step, continuing sequentially the bonding step and  
3 the forming step and the severing step for a predetermined  
4 number of stems to comprise the skeleton.

1 9. The method as claimed in Claim 8, and immediately before each  
2 of the severing steps each of the second stem ends is inti-  
3 mately bonded to the terminal.

1 10. A method for mounting a protuberant conductive contact to a  
2 conductive terminal on an electronic component, the method  
3 comprising sequential steps of:

4 providing a wire having a continuous feed end,  
5 intimately bonding the feed end to the terminal,  
6 forming from the bonded feed end a stem which protrudes  
7 from the terminal and has a first stem end thereat,  
8 severing the stem at a second stem end to define a  
9 skeleton,

10 depositing a conductive material to jacket the skeleton  
11 and adjacent surface of the terminal.

1 11. The method as claimed in Claim 10, and immediately before the  
2 severing step intimately bonding the second stem end to the  
3 terminal.

1 12. The method as claimed in Claim 10, and immediately after the  
2 last mentioned severing step continuing sequentially the  
3 bonding step and the forming step and the severing step for a  
4 predetermined number of stems to comprise the skeleton.

1 13. The method as claimed in Claim 12, and immediately before each  
2 of the severing steps each of the second ends is intimately  
3 bonded to the terminal.

1 14. A method for mounting a protuberant conductive contact to a  
2 conductive terminal on an electronic component, the method  
3 comprising sequential steps of:

4 providing a wire having a continuous feed end,  
5 intimately bonding the feed end to the terminal,  
6 forming from the bonded feed end a stem which protrudes  
7 from the terminal and has a first stem end thereat,  
8 intimately bonding a second stem end to the terminal,  
9 sequentially continuing the forming step and the bonding  
10 step for a predetermined number of times,  
11 after the last bonding step severing the stem to define  
12 a skeleton,

13 depositing a conductive material to envelop the skeleton  
14 and adjacent surface of the terminal.

1 15. A method for mounting a protuberant conductive contact to a  
2 conductive terminal on an electronic component, the method  
3 comprising sequential steps of:

4 providing a wire having a continuous feed end,  
5 intimately bonding the feed end to the terminal,  
6 forming from the bonded feed end a stem which protrudes  
7 from the terminal and has a first stem end thereat,  
8 bonding a second stem end to a sacrificial member mounted  
9 in spaced relationship from the component,

10 severing the stem at the second stem end to define a  
11 skeleton,

12 depositing a conductive material to envelop the skeleton  
13 and at least adjacent surface of the component,  
14 eliminating the sacrificial member.

1 16. The method as claimed in Claim 15, wherein during the elimi-  
2 nating step the second stem ends are severed from the sacrifi-  
3 cial member.

1 17. The method as claimed in Claim 6, 7, 8, 9, 14 or 15, performed  
2 on a plurality of the terminals on the electronic component.

1 18. The method as claimed in Claim 17, performed on a plurality of  
2 wires on a plurality of the terminals on the electronic  
3 component.

1 19. The method as claimed in Claim 17, with the bonding performed  
2 by applying at least one of a group consisting of superambient  
3 pressure, superambient temperature and ultrasonic energy.

1 20. The method as claimed in Claim 17, wherein the severing is  
2 performed by melting the wire.

1 21. The method as claimed in Claim 17, wherein the forming steps  
2 and the severing steps are performed by a wirebonding appara-  
3 tus, and after the severing steps but before the depositing  
4 step shaping the skeleton by means of a tool external to the  
5 apparatus.

1 22. The method as claimed in Claim 17, wherein the severing of the  
2 second ends is performed by mechanical shearing.

1 23. The method as claimed in Claim 17, wherein during the forming  
2 step the shape of the stems is determined by means of a  
3 software algorithm in a control system of an automated  
4 wirebonding apparatus.

- 1 24. The method as claimed in Claim 6, 7, 8, 9 or 15, performed on  
2 a plurality of the terminals, wherein shape of the skeleton  
3 and mechanical properties of the conductive material are  
4 organized collectively to impart resilience to the protuberant  
5 conductive contact.
- 1 25. The method as claimed in Claim 24, wherein the conductive  
2 material is provided with a multitude of microprotrusions on  
3 its surface.
- 4 26. The method as claimed in Claim 17, with the depositing step  
5 including placement of a plurality of layers each differing  
6 from one another.
- 1 27. The method as claimed in Claim 24, wherein the depositing step  
2 includes placement of a plurality of layers each differing  
3 from one another.
- 1 28. The method as claimed in Claim 27, wherein at least one of the  
2 layers comprising conductive material has a jagged topography  
3 in order to reduce contact resistance of the protuberant  
4 conductive contact when mated to a matching terminal.
- 1 29. The method as claimed in Claim 17 or 24, wherein the  
2 deposition is performed by means of electrochemical plating in  
3 an ionic solution.

1 30. The method as claimed in Claim 6 or 8, performed on a plurali-  
2 ty of the terminals and, wherein:

3 the forming steps result in a plurality of free-standing  
4 protuberant stems,

5 the severing steps are performed on the respective stems  
6 all in a common plane.

1 31. The method as claimed in Claim 6 or 8, performed on a  
2 plurality of the terminals on at least one electronic  
3 component and, wherein:

4 the terminals are in different planes,

5 the forming steps result in a plurality of free-standing  
6 protuberant stems,

7 the severing steps are performed on the respective stems  
8 all in a common plane.

1 32. The method as claimed in Claim 6 or 8, performed on a  
2 plurality of the terminals on at least one electronic  
3 component, wherein shapes of the skeleton and mechanical  
4 properties of the conductive material are organized  
5 collectively to impart resilience to the protuberant  
6 conductive contacts, and the severing steps are performed on  
7 the stems all in a common plane.

1 33. The method as claimed in Claim 17 or 24, wherein the cross-  
2 sectional area of the wire is rectangular.



1 34. The method as claimed in Claim 26 or 27, wherein the wire is  
2 made of a metal selected from a group consisting of gold,  
3 silver, beryllium, copper, aluminum, rhodium, ruthenium,  
4 palladium, platinum, cadmium, tin, lead, indium, antimony,  
5 phosphorous, boron, nickel, magnesium and alloys thereof, and  
6 wherein at least one of the layers of the conductive material  
7 is a metal selected from a group consisting of nickel,  
8 phosphorous, boron, cobalt, iron, chromium, copper, zinc,  
9 tungsten, tin, lead, bismuth, indium, cadmium, antimony, gold,  
10 silver, rhodium, palladium, platinum, ruthenium and alloys  
11 thereof.

1 35. The method as claimed in Claim 6, 7, 8, or 14, performed on at  
2 least one terminal on an electronic component, wherein the  
3 wire is made primarily of a metal selected from a group  
4 consisting of gold, copper, aluminum, silver, lead, tin,  
5 indium and alloys thereof; the skeleton is coated with a first  
6 layer of the conductive material selected from a group  
7 consisting of nickel, cobalt, boron, phosphorous, copper,  
8 tungsten, titanium, chromium, and alloys thereof; a top layer  
9 of the conductive material is solder selected from a group  
10 consisting of lead, tin, indium, bismuth, antimony, gold,  
11 silver, cadmium and alloys thereof.

1 36. The method as claimed in Claim 26 or 27, wherein a layer  
2 reactive with material of the wire is interposed between the  
3 skeleton and the conductive material.

1 37. The method as claimed in Claim 26 or 27, wherein the wire is  
2 gold and the reactive layer is tin.

1 38. An electronic component a first and a second surface in which  
2 on at least one of the surfaces is provided a plurality of the  
3 terminals having protuberant conductive contacts mounted  
4 thereto and made by means of the method as claimed in any of  
5 Claims 6, 7, 8, 14, 15 or 34.

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